

PROCESS CARTRIDGE AND ELECTROPHOTOGRAPHIC IMAGE
FORMING APPARATUS

BACKGROUND OF THE INVENTION

5 Field of the Invention

The present invention relates to a process cartridge detachably attachable to an electrophotographic image forming apparatus for forming an image on a recording medium, and to an
10 electrophotographic image forming apparatus.

Related Background Art

In the electrophotographic image forming apparatus using an electrophotographic image forming process, a process cartridge system has
15 conventionally been adopted, in which an electrophotographic photosensitive member and process means for acting on the electrophotographic photosensitive member are integrated into a cartridge, which is made detachably attachable to a main body of
20 the image forming apparatus. This process cartridge system allows the maintenance of the apparatus to be carried out not by a service person but by the user itself, significantly improving the operability. Therefore, the process cartridge system has been
25 widely used in the image forming apparatus.

In the process cartridge, a protecting member is provided for preventing a photosensitive drum from

the deterioration by light, the adhesion of dust and the like when the cartridge is detached from the apparatus main body (refer to, for example, Japanese Patent Application Laid-Open No. 8-16067 and Japanese
5 Patent Application Laid-Open No. 2000-89567).

SUMMARY OF THE INVENTION

The present invention further develops the prior art examples. An object of the present
10 invention is to provide a process cartridge that prevents a drum shutter from becoming accidentally detached from the frame bodies of the process cartridge and an electrophotographic image forming apparatus to which the process cartridge is
15 detachably attachable.

Another object of the present invention is to provide a process cartridge which is smaller in size and an electrophotographic image forming apparatus to which the process cartridge is detachably attachable.

20 A further object of the present invention is to provide a process cartridge detachably attachable to a main body of an electrophotographic image forming apparatus, comprising:

an electrophotographic sensitive drum;
25 a developing roller for developing an electrostatic latent image formed on said electrophotographic sensitive drum;

a drum shutter movable between a protecting position for protecting said electrophotographic photosensitive drum and a retracting position for retracting from the protecting position;

5 a first frame body for rotatably supporting said electrophotographic sensitive drum;

a second frame body for rotatably supporting said developing roller, said second frame body being swingably coupled to said first frame body;

10 an optical path provided between said first frame body and said second frame body for passing light to which said electrophotographic sensitive drum is exposed, the light being irradiated from said main body of the electrophotographic image forming apparatus; and

15 supporting portions for swingably supporting said drum shutter provided on one end and on the other end in the longitudinal direction of said first frame body, said supporting portions being disposed

20 between said first frame body and said second frame body and on the outside of said optical path in the longitudinal direction; and an electrophotographic image forming apparatus to which the process cartridge is detachably attachable.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view schematically

illustrating the construction of an
electrophotographic image forming apparatus;

FIG. 2 is a sectional view schematically
illustrating the construction of a process cartridge;

5 FIG. 3 is an assembly perspective view of a
cleaning means;

FIG. 4 is a perspective view 1 of cleaning
means;

FIG. 5 is a perspective view 2 of cleaning
10 means;

FIG. 6 is an assembly perspective view 1 of
developing means;

FIG. 7 is an assembly perspective view 2 of
developing means;

15 FIG. 8 is an assembly perspective view of a
process cartridge;

FIG. 9 is a final perspective view of a process
cartridge;

FIG. 10 is a schematic perspective view of the
20 left guide of the main body of an image forming
apparatus;

FIG. 11 is a schematic perspective view of the
right guide of the main body of an image forming
apparatus;

25 FIG. 12 is a left side view of a process
cartridge;

FIG. 13 is a right side view of a process

cartridge;

FIG. 14 is a schematic perspective view of a cleaning frame body and a drum shutter;

FIG. 15 is a schematic perspective view of a
5 cleaning frame body and a drum shutter;

FIG. 16 is a schematic sectional view illustrating cleaning means and an optical path; and

FIG. 17 is a schematic perspective view illustrating cleaning means and an optical path.

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DESCRIPTION OF THE PREFERRED EMBODIMENTS

The embodiments according to the present invention will now be described in detail with reference to the drawings. In the following
15 description, the longitudinal direction of a process cartridge means the direction that intersects with the direction for attaching and detaching the process cartridge to the apparatus main body (generally orthogonal direction, axis direction of an image
20 bearing member); and the direction that is parallel to the surface of a recording medium and (generally orthogonally) intersects with the direction for conveying the recording medium. In addition, right and left means the right and the left, respectively,
25 when the recording medium is viewed from above following the conveying direction of the recording medium. Further, the upper surface of the process

cartridge means the surface that is located in the upper position in the state where the process cartridge is mounted on the apparatus main body and the lower surface means the surface located in the lower position.

First, the process cartridge and the electrophotographic image forming apparatus to which the process cartridge is detachably attachable will be described in detail with reference to FIGS. 1 and 2. FIG. 1 is a constitutional explanatory schematic drawing of an electrophotographic image forming apparatus and FIG. 2 is a constitutional explanatory schematic drawing of a process cartridge. Here, in the order of description, the overall construction of a process cartridge and an electrophotographic image forming apparatus using the same will be described first, and then the process cartridge attaching/detaching-construction for attaching and detaching the process cartridge to the main body of the electrophotographic image forming apparatus will be described.

(Overall construction)

The electrophotographic image forming apparatus (laser beam printer, hereinafter referred to as the "image forming apparatus") A, as shown in FIG. 1, irradiates a drum-shaped electrophotographic photosensitive member (hereinafter referred to as the

"photosensitive drum") 7 with the information light based on image information from an optical system 1 as optical means to form an electrostatic latent image on the photosensitive drum 7. The

5 electrostatic latent image is developed with a developer (hereinafter referred to as the "toner") to form a toner image. In synchronization with the formation of the toner image, a recording medium (a recording paper, an overhead transparency sheet, a

10 cloth or the like) 2 is separated and fed one by one from a cassette 3a with a pickup roller 3b and a press-contact member 3c which is in press-contact with the same. The recording medium 2 is conveyed along a conveying guide 3f1 to a process cartridge B.

15 The toner image formed on the photosensitive drum 7 is transferred to the recording medium 2 by applying voltage to a transferring roller 4 as transferring means. The recording medium 2 on which the toner image is transferred is conveyed along a conveying

20 guide 3f2 to fixing means 5. The fixing means 5 has a drive roller 5a and a fixing rotating member 5d comprised of a cylindrical sheet with a built-in heater 5b and rotatably supported by a support member 5c. The passing recording medium 2 is applied with

25 heat and pressure to fix the transferred toner image. The recording medium 2 is conveyed by a discharging roller 3d and discharged through a reverse conveying

path to a discharging portion 6. Note that the pickup roller 3b, the press-contact member 3c and the discharging roller 3d constitute conveying means 3 in the present embodiment.

5 (Process cartridge)

The process cartridge B is provided with an electrophotographic photosensitive drum and at least one process means. The process means include, for example, electrostatic charging means for charging
10 the electrophotographic photosensitive drum, developing means for developing the electrostatic latent image formed on the electrophotographic sensitive drum, cleaning means for cleaning the residual toner on the electrophotographic sensitive
15 toner and the like. In the present embodiment, as shown in FIG. 2, the electrophotographic sensitive drum 7 having a photosensitive layer is rotated. Then, the surface of the photosensitive drum 7 is uniformly charged by applying voltage to the
20 electrostatic charging roller 8 that is electrostatic charging means. The charged photosensitive drum 7 is exposed to the information light based on the image information from the optical system 1 (optical image) through an exposing opening 9b. Thus, the
25 electrostatic latent image is formed on the surface of the photosensitive drum 7. The electrostatic latent image is developed by the developing means 10.

The developing means 10 carries the toner in a toner containing portion 10a using a rotatable carrying member 10b that is toner carrying means. Then, a developing roller 10d with a built-in
5 stationary magnet 10c that is a developing rotating member (developer carrying member) is rotated, and the toner layer in which frictional charge is generated by a developing blade 10e is formed on the surface of the developing roller 10d. The toner is
10 then transferred to the photosensitive drum 7 corresponding to the electrostatic latent image. Thereby, the toner image is visualized by forming it on the photosensitive drum 7.

The transferring roller 4 is then applied with
15 the voltage having the polarity opposite to the toner image to transfer the toner image to the recording medium 2. After the transfer, a cleaning blade 11a scrapes the residual toner off the photosensitive drum 7. The scraped toner is then scooped with a
20 scooping sheet 11b and collected in a removed toner containing portion 11c. The residual toner on the photosensitive drum 7 is removed by the cleaning means 11 having the cleaning blade 11a and the scooping sheet 11b.

25 The process cartridge B shown in the present embodiment rotatably supports the photosensitive drum 7 and has a cleaning frame body 11d (first frame

body) incorporating the cleaning means 11 and the electrostatic charging roller 8 and a toner developing frame body 10f (second frame body) incorporating the developing means 10 and the toner
5 containing portion 10a. The toner developing frame body 10f is swingably supported relative to the cleaning frame body 11d so that the developing roller 10d in the developing means 10 can be opposed in parallel to the photosensitive drum 7 with a specific
10 clearance. Spacers 10m (refer to FIG. 7) for keeping the clearance between the developing roller 10d and the photosensitive drum 7 are provided at both ends of the developing roller 10d. Holder members 10g are provided at both sides of the toner developing frame
15 body 10f. And the toner developing frame body 10f has hanging arms 10g7 in which coupling holes 10g8 for rotatably hanging the developing unit from the cleaning unit are formed. A certain pressure is applied to the developing unit (second frame body)
20 and the cleaning unit (first frame body) for keeping the clearance between them.

The construction of the cleaning means 11 will now be described in detail with reference to FIGS. 2, 3 and 4.

25 In the cleaning means 11, a first sealing member 11e which prevents the toner from the back side at both ends of the rubber of the cleaning blade.

11a from leaking from the removed toner containing
portion 11c and a second sealing member 11h which
prevents the toner leakage at the backside of the
cleaning blade are fixed with double-faced tapes and
5 the like at specific positions of the cleaning frame
body 11d. The cleaning blade is fastened with screws
at a specific position of the cleaning frame body 11d,
preventing the toner from leaking from both ends of
the rubber of the cleaning blade 11a. A third
10 sealing member 11f as a member for wiping deposits on
the photosensitive drum such as toner and the
scooping sheet 11b are fixed with double-faced tapes
11g and the like on the cleaning frame body 11d. In
addition, an electrode 8c for supplying electricity
15 to the electrostatic charging roller 8 from the main
body of the image forming apparatus A is inserted in
the cleaning frame body 11d.

Further, a roller bearing 8b which supplies
electricity from the electrode 8c to the
20 electrostatic charging roller 8 and serves as a
bearing and the other bearing 8a are mounted in the
cleaning frame body. The shaft of the electrostatic
charging roller 8 is inserted into the bearings 8b
and 8a.

25 The photosensitive drum 7 is coupled on one end
with coupling means 70 for transferring the drive and
a drum gear 71 in which a gear for transferring the

drive to the developing roller 10 and the transferring roller 4, a grounding contact and the like are integrated. In addition, the photosensitive drum 7 is coupled on the other end with a flange 85
5 having a bearing. The photosensitive drum 7 is supported by being pressed to the cleaning frame body 11d such that a bearing 18c is fastened with screws to the side of the coupling means 70 and a dowel pin 18d fits into a locating portion 18b on the other
10 side.

In the process cartridge B of the present embodiment, a drum shutter 12 which can integrally cover a transferring opening 9a for the photosensitive drum opposed to the transferring
15 roller and an exposing opening 9b is rotatably mounted on the cleaning frame body 11d. The construction of the drum shutter 12 will now be described. The drum shutter 12 has a drum protecting portion 12a capable of covering the transferring
20 opening 9a in which the photosensitive drum 7 abuts the transferring roller 4. A rotating shaft 12b to be rotatably supported in the neighborhood of the electrostatic charging roller 8 in the cleaning frame body 11b is provided with sliding portions 12b1 which
25 slide with the cleaning frame body 11b at both ends of the rotating shaft 12b and a portion 12b3 for connecting the sliding portions 12b1 at the both ends.

The drum shutter 12 has connecting portions 12c provided at two locations in the right and left which connect both ends of the drum protecting portion 12a and the rotating shaft 12b at the outside of them. A
5 rib 12e is provided which is disposed on the outside of the rotating shaft 12b1, provided on the right connecting portion 12c and extends to the outside in the longitudinal direction of the drum shutter 12. The rib 12e is received by a shutter guide Gb9 of a
10 guide Gb provided in the main body of the image forming apparatus to keep the attitude that the drum shutter 12 is open.

The drum shutter 12 is energized in the direction that the drum shutter 12 covers the
15 photosensitive drum 7 by a spring force of a shutter spring 12d. Thereby, in the state where the process cartridge B is taken out of the apparatus main body, the drum shutter 12 keeps the state where it covers the transferring opening 9a of the photosensitive
20 drum 7 as shown in FIG. 4 or 5. On the other hand, when the cartridge B is in the state where it is ready for image forming operation within the apparatus main body, the drum shutter 12 is rotated by drum shutter open/close means in the main body of
25 the image forming apparatus and takes the attitude that the transferring opening 9a is exposed as shown in FIG. 1 or 2 and the photosensitive drum 7 can abut

against the transferring roller 4.

The mounting of the drum shutter 12 to the cleaning frame body (first frame body) 11d will be described further in detail. The cleaning frame body 5 11d is provided with guide portions 11d1 and 11d2 which movably hold the bearings 8a and 8b, which swingably support the electrostatic roller 8 as described above, in generally the same direction as the direction of the straight line connecting the 10 center of the photosensitive drum 7 and the center of the electrostatic charging roller 8. The guide portions 11d1 and 11d2 are constructed such that the bearings 8a and 8b are pinched from two directions. The guide portions 11d1 and 11d2 are provided in the 15 side close to the cleaning blade 11a and in the exposure side, that is, the side of the developing means 10. Of the guide portion 11d1 and 11d2, the guide portions 11d11 and 11d21 in the exposure side, that is, the side of the developing means 10 are 20 provided with support portions 11d3 by which sliding portions 12b1 of the rotating shaft 12b of the drum shutter 12 are rotatably supported. The supporting portions 11d3, as shown in FIG. 16, are disposed projecting to the side of the optical path Z that is 25 irradiated from a scanner (not shown) viewing from the rotating axis direction, that is, the sectional direction of the photosensitive drum 7, in order to

expose the photosensitive drum 7. In addition, the longitudinal position of the supporting portions 11d3, as shown in FIG. 17, are disposed on the outside in the longitudinal direction of the optical path Z that is irradiated from the scanner (not shown). Thus, the supporting portions 11d3 are disposed in the space for the optical path Z provided between the developing means 10 and the cleaning means 11. This construction results in space savings of the cartridge. Each of the sliding portions 12b1 has a generally circular boss shape. Each of the sliding portions 12b1 is provided with a straight portion (D-cut portion) 12b11 on a part of the peripheral portion to be mounted on the supporting portion 11d3. The straight portion (D-cut portion) 12b11 is provided in two locations on the peripheral portion in generally parallel positions with each other. Each of the supporting portions 11d3 has the shape of a round hole in order to swingably support the sliding portion 12b1. In addition, a part of it has an open portion 11d31 which is open for mounting the drum shutter 12. The drum shutter 12 is mounted at the position where the straight portion of the sliding portion 12b1 is engaged with the open portion 11d31 of each of the supporting portions 11d3. Here, the engaging position is provided further downstream in the direction that the drum shutter 12 rotates

from the position covering the transferring opening 9a to the position exposing the transferring opening 9a in the main body of the image forming apparatus. Therefore, for mounting the cartridge B on the

5 apparatus main body, when the drum shutter 12 rotates from the position covering the transferring opening 9a to the position exposing the same, the straight portion (D-cut portion) of the sliding portion 12b1 will not mate with the open portion 11d31 of each of

10 the supporting portions 11b3. Consequently, the drum shutter 12 will not become detached from the cleaning frame body (first frame body). In addition, when the cleaning means (first frame body) 11 and the

developing means (second frame body) 10 are coupled

15 to the state of the process cartridge B, end members 10g provided in the developing means 10 restrict the drum shutter 12 from further rotating from the position where the transferring opening 9a is opened. So the drum shutter 12 cannot rotate to the position

20 where the straight portion (D-cut portion) 12b11 of the sliding portion 12b1 is coupled with the open portion 11d31 of each of the supporting portions 11d3. This also prevents the drum shutter 12 from becoming detached from the cleaning frame body 11d. In

25 addition, the above described supporting portions 11d3 and guide portions 11d1 and 11d2 are provided at the position inside from the both ends in the thrust

direction (photosensitive drum axis direction).
Therefore, after coupling the cleaning means 11 and
the developing means 10, it is difficult for an
operator to access the supporting portions 11d3 from
5 outside. This also prevents the drum shutter 12 from
becoming detached from the cleaning frame body 11d.
Further, the guide portions 11d1 and 11d2, in which
the supporting portions 11d3 and the supporting
portions 11d3 are provided, are provided at the
10 inside in the thrust direction of an arms 10g7 of the
end members 10g provided in the developing means 10.
Thereby, after coupling the cleaning means 11 and the
developing means 10, it is difficult to access the
supporting portion 11d3 from outside.

15 The above described embodiment is summarized as
follows. The above described embodiment comprises a
process cartridge comprising a cleaning frame body
11d (first frame body) swingably supporting an
electrophotographic photosensitive drum 7, a toner
20 developing frame body 10f (second frame body)
swingably supporting a developing roller 10d and a
drum shutter 12 which is movable between a protecting
position for protecting the electrophotographic
photosensitive drum 7 and a retracting position for
25 retracting from the protecting position, wherein the
drum shutter 12 is swingable about supporting
portions 11d3 provided in the cleaning frame body

11d; the supporting portions 11d3 are provided projecting to the side of a space from the cleaning frame body 11d viewed from the axis direction of the photosensitive drum 7; and the supporting portions 5 11d3 are provided at the outside of an optical path Z for exposing the photosensitive drum 7 which is provided between the cleaning frame body 11d and the toner developing frame body 10f in the longitudinal direction of the photosensitive drum 7. In addition, 10 the supporting portions 11d3 are disposed at the inside in the longitudinal direction of both sides of the cleaning frame body 11d. Further, the cleaning frame body 11d has an electrostatic charging roller 8 for charging the surface of the photosensitive drum 7 15 and an electrostatic roller supporting portions for supporting the electrostatic charging roller 8 are provided integrally with the cleaning frame body 11d, wherein the supporting portions 11d3 are provided on a part of the electrostatic charging roller 20 supporting portions 8d. Furthermore, the drum shutter 12 has a protecting portion for protecting the photosensitive drum 7, supporting arm portions provided on the both ends in the longitudinal direction and connecting portions for connecting the 25 supporting arm portions, wherein the connecting portions are provided between the cleaning frame body 11d and the toner developing frame body 10f.

The developing means 10 of the process cartridge B will now be described in detail.

The developing means 10, as shown in FIGS. 2, 6 and 7, constitutes a toner chamber (toner containing
5 portion) 10a and a developing chamber 10i by combining a toner developing frame body 10f1 and a lid member 10f2.

The toner developing frame body 10f1 contains an agitation shaft 10b1 for supplying toner and a
10 sheet member 10b2 fixed to the agitation shaft 10b1. A carrying gear 10b3 for restricting the transmission of the drive force and the agitation shaft 10b1 in the longitudinal direction is coupled to the agitation shaft 10b1 together with a sealing member
15 10b4 for preventing toner from leaking outside the toner developing frame body 10f1.

In addition, in the toner developing frame body 10f1, there is provided a toner-passing opening 10k through which the toner contained in the toner
20 chamber 10a passes when supplied to the developing roller 10d.

The toner sealing member 27, as shown in FIG. 6, is fixed by heating to a seal mounting portion 10h along the four edges of the toner-passing opening 10k.
25 In addition, at one end in the longitudinal direction of the toner developing frame body 10f1, there is provided a toner filling port (not shown) for filling

toner to the toner chamber 10a. The toner filling port is sealed by a cap member 10j after filling toner.

Then, a description will be made using FIG. 7.

5 The toner developing frame body 10f1 is mounted with end seals 10r for preventing the leakage of toner at both ends of the developing roller 10d. Seal members 10s for preventing the toner from leaking at both ends of a developing blade 10e are
10 adhered with double-faced tapes or the like to the toner developing frame body 10f1 and the lid member 10f2. The developing blade 10e is fastened with screws to the toner developing frame body 10f1 at both ends of a sheet metal portion 10e1 together with
15 removing members 10t for removing toner at the ends of the developing roller 10d. Here, the rib 10f3 with a tapered tip of the toner developing frame body 10f1 has the dimension that is designed so that it is positively engaged in a developing blade rubber
20 portion 10e2. Thus, the rubber portion 10e2 of the developing blade 10e and the toner developing frame body 10f1 remain sealed.

(Construction of end members)

25 One of the end members 10g disposed at both sides in the longitudinal direction of the developing means 10 covers the gear train consisting of a developing roller gear 10n (refer to FIGS. 7 and 8)

which is fixed to the end of the developing roller engaged with a drum gear (not shown) fixed to the end of the photosensitive drum 7 and two idler gears 10p and 10q for transmitting the drive force from the
5 developing roller gear 10n to the carrying gear 10b3 of the toner carrying member 10b.

A pull-out portion 27a of the toner sealing member 27 is folded at one end in the longitudinal direction of the toner passing-opening 10k and pulled
10 out to the outside through a hole 10f11 (refer to FIG. 6) of the toner developing frame body 10f1.

Then, the thus constructed developing means 10 and cleaning means 11 are combined as described below, as shown in FIG. 8. The two end members 10g have arm
15 portions 10g7 which are projecting toward the cleaning frame body 11d. The cleaning frame body 11d and the end members 10g are swingably coupled by pins 60 which are inserted into coupling holes 10g8 provided in the longitudinal direction at the tip of
20 the arms 10g7 and coupling holes (not shown) provided on the cleaning frame body. A compression spring 10g9a, in which a spring stopper in one of the end members 10g is inserted inside the inner diameter thereof, is provided compressed against the cleaning
25 frame body 11d. On the other end, a tension spring 10g9b is hung between the cleaning frame body 11d and the end member 10g. Thereby, the clearance-keeping

members 10m at both sides of the developing roller 10d are brought into press-contact with the photosensitive drum 7. Consequently, the developing roller 10d and the photosensitive drum 7 are kept
5 with a specific clearance. Thus, the process cartridge B is completed.

When a user uses the cartridge B, the toner sealing end 27a (FIG. 9) is held and pulled out. Thereby, the toner-passing opening 10k of the toner
10 developing frame body 10f1 is opened. Then, the toner in the toner chamber 10a is ready for being carried into the developing chamber 10i. Thus, the cartridge B is prepared to be inserted into the main body of the image forming apparatus A.
15 (Attaching and detaching of the process cartridge B to and from the main body of the image forming apparatus)

The cartridge B assembled as described above is mounted on the main body of the image forming
20 apparatus A for forming images. The aspects of the mounting will be described with reference to FIGS. 9 to 11.

The bearing member 18c mounted on the cleaning frame body 11d of the cartridge B is provided with an
25 arc portion (first abutting portion) 18c1 provided coaxially with the drum center axis as a mounting guide for guiding the cartridge B when the cartridge

B is mounted on the main body of the image forming apparatus A and a rotation stopping portion (second abutting portion) 18c2 for controlling the attitude positioned at the corner of the bearing member 18c and provided at the bottom of the cartridge frame body. Here, the rotation stopping portion 18c2 is arc shaped.

The arc portion 18c1 is positioned in the outside of the developing means 10 (developing roller 10d) in the drum axis direction of the developing means 10 (developing roller 10d) and disposed so as to overlap with at least a part of the developing means 10 (developing roller 10d) on the cross section. In addition, the rotation stopping portion 18c2 is located in the outside of the developing means 10 (developing roller 10d) and overlaps with it at all points in the drum axis direction of the developing means 10 (developing roller 10d). Further, the rotation stopping portion 18c2 is disposed at the rear in the insertion direction of the arc portion 18c1.

According to the present embodiment, a triangle coupling portion 70 which receives a driving force from the main body of the image forming apparatus A is disposed at the inside in the drum axis direction of the bearing member 18c.

The main body of the image forming apparatus A,

as shown in FIGS. 10 and 11, is provided with a guide member Ga as a first main body guide for guiding the process cartridge B to the image forming position (mounting position) by sliding the above described two portions, the arc portion 18c1 and the rotation
5 stopping portion 18c2.

On the other hand, the drum frame body 102 on the side opposed in the drum axis direction to the bearing member 18c of the cartridge B is provided
10 with a locating portion 18b for covering a drum supporting shaft 18d and a projection 11g for controlling the position of the cartridge B when the cartridge B is attached to and detached from the apparatus main body A.

15 In addition, the main body of the image forming apparatus A, as shown in FIGS. 10 and 11, is provided with a guide member Gb as a second main body guide so that the attitude of the cartridge B that is controlled at the bearing member 18c side is also
20 kept at the opposed side and the cartridge B is not oblique to the drum axis direction.

Referring to FIGS. 9 to 13, the aspect of the mounting of the cartridge B to the apparatus main body A will now be described.

25 Firstly, a retractable door member (not shown) constructing a discharging portion 6 of the main body of the image forming apparatus A is opened to expose

the guide members Ga and Gb. The arc portions 18c1 and 18c2 of the cartridge B are placed on a first guide surface Ga1 of the guide member Ga which is a little curved in the front, such that the arc portion 5 18c of the cartridge B is in the front and the rotation stopping portion 18c2 is in the rear. Then, the locating portion 18b and the projection 11g of the cartridge B are placed on a first guide surface Gb1 of the other guide member Gb.

10 The cartridge B is pushed into the main body of the image forming apparatus A while keeping this state.

 Thereby, the arc portion 18c1 and rotation stopping portion 18c2 are guided by sliding to the 15 mounting position defined by a second guide surface Ga2 provided in a generally vertical direction to the first guide surface Ga1, a third guide surface Ga3 provided in a generally horizontal direction from the second guide surface Ga2 and a curved fourth guide 20 surface Ga4 provided adjacent to the third guide surface Ga3.

 Thereby, the cartridge B abuts the fourth guide surface Ga4 as a first main body-receiving portion at the arc portion 18c1. In addition, the cartridge B 25 is placed on the third guide surface Ga3 in the state where a rear curved portion of the rotation stopping portion 18c2 abuts the second guide surface Ga2. In

this placement, the transferring roller 4 and the photosensitive drum 7 are in a state abutted with each other. Thus, a repulsive force is imparted to the cartridge B in the direction of the arrow in FIG.

5 13. At this time, a third abutting portion 18c3 abuts a fifth guide surface Ga5 located adjacent to the Ga3 to prevent a displacement of the position of the cartridge B. The third abutting portion 18c3 may be integral or separate with the second abutting
10 portion 18c2 which is the rotation stopping portion.

On the other hand, the locating portion 18b and the projection 11g on the opposite side of the cartridge B are guided by sliding to the mounting position defined by a plurality of guide surfaces,
15 sequentially provided from the first guide surface Gb1, such as a second guide surface Gb2, a third guide surface Gb3 and a fourth guide surface Gb4. Finally, the locating portion 18b is guided to a locating position Gb5.

20 As described above, the cartridge B is mounted on the mounting position relative to the apparatus main body A. Then, when the door of the apparatus main body A is closed, a triangle coupling 7a1 of the cartridge B engages in a drive transmitting member
25 having a cross section of a generally triangle distorted recess (not shown). Thereby, the rotating drive force is transmitted to the cartridge B from

the apparatus main body A.

Thereby, the cartridge B rotates about the axis of the photosensitive drum 7. At this time, a clearance is formed between the third abutting
5 portion 18c3 of the bearing member 18c which has been abutting the guide and the guide surface Ga5. Thus, the rotation stopping portion 18c2 of the bearing member 18c abuts the third guide surface Ga3 which is a defining surface of the guide member Ga to locate
10 the direction of rotation.

On the other hand, when mounting the cartridge B, the locating portion 18b on the drum axis of the drum frame body 102 on the opposite side in the drum axis direction is housed in a U-shaped groove which
15 is a locating portion provided in the fourth guide surface Gb4. Thereby, the locating portion 18b is located by a presser bar spring (not shown) for suppressing the repulsive force or run-out of the transferring roller 4. The projection 11g of the
20 drum frame body C is designed such that it has the position and the size that will not abut the apparatus main body A within the accuracy of parts and assembly.

Further, during the aspect of the mounting as
25 above described, the projection 12e of the drum shutter 12 abuts a first shutter guide surface Gb7 provided in the guide Gb. Thereby, the action of

rotation of the shutter 12 is started. Then, with the aspect of the mounting of the cartridge B, the projection 12e abuts a second shutter guide surface Gb8 and slides. Finally, the shutter 12 is held in
5 the state shown in FIGS. 1 and 2 by a third guide surface Gb9.

The above described attitude becomes the attitude of the cartridge B during the image forming, and the image forming is started.

10 When the cartridge B is removed from the apparatus main body A, it is removed from the apparatus position to the outside of the apparatus along the corresponding guides Ga and Gb of the apparatus main body A by the reverse operation to the
15 above described mounting operation. At the same time, the shutter 12 is rotated and closed successively so as to cover the photosensitive drum 7.

Accidentally, when the cartridge B is taken out of the mounting position, the projection 11g is
20 brought into contact with the fifth guide surface Gb5 on the upper surface of the guide member Gb and restricts the front side in the taking-out direction of the cartridge B from rotating upward more than a specific amount.

25 Moreover, the case for forming a monochrome image is illustrated in the cartridge shown in the above described embodiment, but the cartridge

according to the present invention can be suitably applied to the cartridge in which a plurality of developing means are provided and images of a plurality of colors (e.g. two-color image, three-
5 color image or full-color, etc.) are formed.

Moreover, the electrophotographic sensitive member is not limited to the sensitive drum and includes the followings. A photoconductor is used as a photosensitive member. The photoconductor includes,
10 for example, amorphous silicon, amorphous selenium, zinc oxide, titanium oxide and an organic photoconductor (OPC). As the shape for loading the sensitive member, for example, a drum-shape or a belt-shape is used. For example, a drum-type
15 sensitive member is prepared by vapor-depositing or coating a photoconductor on a cylinder made of an aluminum alloy or the like.

Moreover, as a developing method, various known developing methods can be used such as two-component
20 magnetic brush development, cascade development, touch down development and cloud development.

Moreover, as the construction of the electrostatic charging means, a so called contact electrification process has been used in the above
25 described embodiment. However, as a different construction, a conventionally used construction can naturally be used, in which three sides of the

periphery of a tungsten wire are applied with a metal shield such as aluminum, and positive or negative ions generated by applying high voltage to the tungsten wire is transferred to the surface of a photosensitive drum, charging the surface of the drum uniformly.

Further, the electrostatic charging means may include, other than the roller-type, a blade (electrostatic charging blade), a pad-type, a block-type, a rod-type, a wire-type or the like.

Further, the method for cleaning the residual toner on the photosensitive drum may include the cleaning means using a blade, a fur brush, a magnetic brush or the like.

Moreover, the above described process cartridge means the cartridge in which an electrophotographic sensitive drum and developing means as process means are integrally assembled and which is made detachably attachable to the apparatus main body. The process cartridge can be detachably attachable to the apparatus main body by a user itself. Therefore, the maintenance of the apparatus main body can be carried out by the user itself.

Furthermore, although a laser beam printer has been illustrated as an electrophotographic image forming apparatus in the above described embodiment, the present invention need not be limited by the

laser beam printer and can naturally be used for electrophotographic image forming apparatuses such as, for example, an electrophotographic copier, an electrophotographic printer such as an LED printer, a
5 facsimile apparatus, a word processor or multiple function machines thereof (such as a multifunction printer).

According to the above described embodiment, portions for rotatably supporting a drum shutter can
10 be located at the inside of the both ends in the longitudinal direction by providing the portions for rotatably supporting a drum shutter at the position adjacent to the portions for supporting an electrostatic charging roller in a cleaning frame
15 body. Consequently, after a developing means is coupled, direct access to the supporting portions becomes difficult. Thus, it is possible to prevent the drum shutter from being accidentally detached from the cleaning frame body.

20 Moreover, the portions for rotatably supporting the drum shutter, among the guide portions for supporting the electrostatic charging roller, are provided on the side opposed to the developing means. Therefore, after coupled with the developing means,
25 it becomes difficult to easily remove the drum shutter. Thus, it is possible to prevent the drum shutter from being accidentally detached from the

cleaning frame body. As described above, the drum shutter is not easily detached according to the present invention.